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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,699	10/20/2003	Young-hoon Jeong	Q77117	2834
23373 7590 03/31/2008				
SUGHRUE MION, PLLC				
2100 PENNSYLVANIA AVENUE, N.W.				
SUITE 800				
WASHINGTON, DC 20037				
EXAMINER				
LEE, TOMMY D				
ART UNIT		PAPER NUMBER		
2625				
MAIL DATE		DELIVERY MODE		
03/31/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/687,699

Applicant(s)

JEONG, YOUNG-HOON

Examiner

Thomas D. Lee

Art Unit

2625

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 March 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 12-18 and 22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 12-18 and 22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SI/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 6, 2008 has been entered.

Response to Amendment

2. This Office action is responsive to Applicant's AMENDMENT UNDER 37 C.F.R. § 1.116, filed February 6, 2008. Claims 1-8, 12-18 and 22 are pending.

Response to Arguments

3. Applicant's arguments with respect to claims 1-23, previously rejected under 35 U.S.C. 102(b) or 103(a), have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-3, 6-8, 12, 13, 16-18 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,822,451 (Spaulding et al., hereinafter Spaulding) in view of U.S. Patent 5,768,411 (Shu et al., hereinafter Shu).

Regarding claims 1-3, Spaulding discloses an apparatus for halftoning a color image comprising: an address generator that receives a pixel in an image intended for halftoning and generates an address corresponding to a position of the pixel in a mask memory storing mask threshold values for one color channel (column 4, lines 7-16); a mask generator that receives a respective stored mask threshold value corresponding to the address from the mask memory and generates respective mask threshold values for each of a plurality of color channels (column 4, lines 16-22); and a comparison unit that sequentially receives the respective mask threshold value generated for each of the plurality of color channels and a pixel value in the image intended for halftoning, compares both values with each other, and outputs a bilevel value according to a predetermined rule (column 4, lines 22-30). The address generator comprises: a pixel position information storage unit that receives the pixel in the image intended for halftoning and stores the position of the pixel (multi-channel input color images 40A, 40B, 40C generate image column and row addresses x and y); a mask memory that stores mask threshold values for each color channel generated according to a predetermined algorithm (optimized dither matrices 44A, 44B, 44C); and a mask address generator that sequentially receives information on the pixel position from the pixel position information storage unit and generates the address corresponding to the position in the mask memory, the pixel position information storage unit comprising an X-direction counter that counts X-coordinates of pixels, and a Y-direction counter that counts Y-coordinates of pixels (modulo operators 42A, 42B, 42C convert column and

row addresses from multi-channel input images to dither matrix column and row addresses x_d and y_d).

Spaulding does not disclose generation of respective mask threshold values for each of a plurality of color channels "based on said received respective stored mask threshold value," as recited in claim 1. However, Shu discloses a mask generator comprising: a mask information input unit that receives mask information for one color channel generated by a predetermined algorithm (reference dither matrix (cyan) shown in Fig. 3A); an offset calculator that calculates a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and a mask calculator that calculates masks for a plurality of channels using information on the predetermined offset calculated by the offset calculator (magenta and yellow matrices generated by adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). Clearly, respective mask threshold values for each of a plurality of color channels (magenta and yellow) are generated, based on a received respective stored mask (cyan matrix) threshold value. This enables production of separate threshold values for each color without the need to provide storage of the threshold values in separate dither matrices for each color, thereby reducing memory requirements for the apparatus. Furthermore, applying the dithering method of Shu to the teaching of Spaulding assures that dots of the different colors do not coincide with each other in light-colored regions, thereby providing a smoother appearance (Shu: column 4, line 60 – column 5, line 2; column 5, lines 33-47). Therefore, it would have

been obvious for one of ordinary skill in the art to modify the teaching of Spaulding by providing the offset and mask calculators as disclosed in Shu.

Regarding claims 6-8, Shu discloses a mask information input unit that receives the respective stored mask threshold value for the mask memory (reference dither matrix (cyan) shown in Fig. 3A); an offset calculator that calculates a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and a mask calculator that calculates the respective mask threshold value for each of the plurality of channels using information of the predetermined offset calculated by the offset calculator and the respective stored mask threshold value (magenta and yellow matrices generated by adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). The offset calculator calculates the predetermined offset by dividing a largest pixel value in the image intended for halftoning by a number of colors used in the halftoning apparatus (magenta and yellow matrices generated by adding one-third and two thirds of the pixel component value range to corresponding elements of the cyan matrix (column 5, lines 41-47)). In order to generate the respective mask threshold value for each of the plurality of channels, the mask calculator receives the respective stored mask threshold value from the mask information input unit, adds the predetermined offset calculated by the offset calculator to the respective stored mask threshold value, and if a resulting value is greater than a largest pixel value, calculates the respective mask threshold value by subtracting the largest pixel value from the resulting value (noting Fig. 6, when the yellow threshold or

the magenta threshold reaches a value corresponding to the pixel component value range, the threshold returns to zero).

Regarding claims 12 and 13, Spaulding discloses a method for halftoning a color image comprising the steps of: (a) receiving a pixel in an image intended for halftoning and generating an address corresponding to a position of the pixel in a mask memory storing mask threshold values for one color channel (column 4, lines 7-16); (b) receiving a respective stored mask threshold value corresponding to the address from the mask memory and generating respective mask threshold values for each of a plurality of color channels (column 4, lines 16-22); and (c) sequentially receiving the respective mask threshold value generated for each of the plurality of color channels and a pixel value in the image intended for halftoning, comparing both values with each other, and outputting a bilevel value according to a predetermined rule (column 4, lines 22-30). The step (a) comprises the steps of: (a1) storing in advance the respective stored mask threshold value for one color channel generated according to a predetermined algorithm (optimized dither matrices 44A, 44B, 44C); (a2) receiving the pixel in the image intended for halftoning and storing the position of the pixel (multi-channel input color images 40A, 40B, 40C generate image column and row addresses x and y); and (a3) sequentially receiving information on the pixel position stored in the step (a2) and generating the address of the respective stored mask threshold value in the mask memory corresponding to the position (modulo operators 42A, 42B, 42C convert column and row addresses from multi-channel input images to dither matrix column and row addresses x_d and y_d).

Spaulding does not disclose generation of respective mask threshold values for each of a plurality of color channels "based on said received respective stored mask threshold value," as recited in claim 12. However, as mentioned above regarding claim 1, Shu discloses a mask generator comprising: a mask information input unit that receives mask information for one color channel generated by a predetermined algorithm (reference dither matrix (cyan) shown in Fig. 3A); an offset calculator that calculates a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and a mask calculator that calculates masks for a plurality of channels using information on the predetermined offset calculated by the offset calculator (magenta and yellow matrices generated by adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). Clearly, respective mask threshold values for each of a plurality of color channels (magenta and yellow) are generated, based on a received respective stored mask (cyan matrix) threshold value. This enables production of separate threshold values for each color without the need to provide storage of the threshold values in separate dither matrices for each color, thereby reducing memory requirements for the apparatus. Furthermore, applying the dithering method of Shu to the teaching of Spaulding assures that dots of the different colors do not coincide with each other in light-colored regions, thereby providing a smoother appearance (Shu: column 4, line 60 – column 5, line 2; column 5, lines 33-47). Therefore, it would have been obvious for one of ordinary skill in the art to modify the teaching of Spaulding by providing the offset and mask calculators as disclosed in Shu.

Regarding claims 16-18, Shu discloses the steps of: (b1) receiving the respective stored mask threshold value from the mask memory (reference dither matrix (cyan) shown in Fig. 3A); (b2) calculating a predetermined offset (fractions of pixel component value range determined (column 5, lines 33-47)); and calculating the respective mask threshold value for each of the plurality of channels using information of the predetermined offset calculated in the step (b2) and the respective stored mask threshold value (magenta and yellow matrices generated by adding fractions of pixel component range to corresponding values of cyan matrix (column 5, lines 33-47)). The predetermined offset is calculated by dividing a largest pixel value in the image intended for halftoning by a number of colors used for the halftoning method (magenta and yellow matrices generated by adding one-third and two thirds of the pixel component value range to corresponding elements of the cyan matrix (column 5, lines 41-47)). The respective mask threshold value is generated for each of the plurality of channels by receiving the respective stored mask threshold value stored in the mask memory, adding the predetermined offset to the respective stored mask threshold value, and if a resulting value is greater than a largest pixel value, calculates the respective mask threshold value by subtracting the largest pixel value from the resulting value (noting Fig. 6, when the yellow threshold or the magenta threshold reaches a value corresponding to the pixel component value range, the threshold returns to zero).

Claim 22 recites the limitations of above-rejected claim 12, recorded on a computer-readable recording medium. While a computer-readable recording medium is not expressly disclosed in Spaulding in view of Shu, it is well known in the art to provide

either an internal ROM or an external storage device, such as a CD-ROM, for providing instructions to a CPU, and such means are necessary for enabling the CPU to perform image processing. It would have been obvious for one of ordinary skill in the art to provide a storage device for storing program instructions in Spaulding in view of Shu, thereby enabling the CPU to perform the halftoning operation.

6. Claims 4, 5, 14 and 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Spaulding in view of Shu as applied to claims 2 and 12 above, and further in view of U.S. Patent 6,154,195 (Young et al., hereinafter Young).

Regarding claims 4, 5, 14 and 15, Spaulding in view of Shu does not expressly disclose the use of an 8x8 Bayer Dither Table. Young discloses a method for performing dithering, using an arrangement similar to that of Spaulding (Fig. 5), and employing a Bayer dither matrix for halftoning image data (column 7, lines 53-67). It would have been obvious for one of ordinary skill in the art to modify the teaching of Spaulding in view of Shu by using a Bayer dither matrix, as disclosed in Young, so as to reduce banding artifacts to get smoother transitions between color gradients (column 7 lines 53-57). Young shows a 4x4 matrix (Fig. 4), but one of ordinary skill in the art would have recognized the size of the dither matrix used for halftoning image as a matter of design choice.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas D. Lee whose telephone number is (571) 272-7436. The examiner can normally be reached on Monday-Friday, 7:30-5:00, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward L. Coles can be reached on (571) 272-7402. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Thomas D Lee/
Primary Examiner, Technology Division 2625